

Interactive comment on “Decadal Changes in the Leading Patterns of Sea Level Pressure in the Arctic and Their Impacts on the Sea Ice Variability in Boreal Summer” by Nakbin Choi et al.

Anonymous Referee #1

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General

This paper is telling is that September sea ice conditions are strongly shaped by atmospheric circulation patterns during summer, and that atmospheric circulation patterns are variable and have shifted over time. We have known this for many years, and a number of previous efforts have also noted that as the ice thins, relationships between atmospheric circulation anomalies and sea ice responses may be changing. In this sense, the present paper, while impressive in terms of depth of analysis, isn't really telling us anything fundamentally new.

Specific

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Abstract, Page 1, Line 15: What month is this correlation based on? September ice extent against summer circulation? Be specific.

Page 1, line 24: The downward trends in sea ice extent involve more than “rapid melting”.

Page 1, Line 25-28: Over what period did Serreze et al. [2007] compute the trend? The 12.4% per decade trend cited in later studies is not “expedited”, it is simply based on a longer sea ice record. Also, percent per decade trends are meaningless numbers without clearly citing the baseline averaging period.

Page 1, Line 29: Surface warming is not Arctic amplification – AA refers to a comparison between temperature trends between the Arctic and the globe as a whole (or the northern hemisphere). And there seems to be a misunderstanding here – a large component of AA seems to be due to ice loss (the ocean loses heat to the atmosphere in autumn and winter), rather than the cause of it.

Page 2, line 3 and elsewhere in the text: A “declining trend” implies that the trend is getting smaller. The correct term is “downward trend”

Page 2, line 5: To state that the underlying mechanisms for sea ice variability in summer are still “under debate” is quite a stretch. Scientists have been looking at these mechanisms (atmospheric and oceanic variability) for many years. The authors should be citing earlier pioneering studies – from the way the text reads, there was no research on mechanisms behind sea ice variability before the dawn of the 21st century. We all stand on the shoulders of those before us. Give credit where credit is due.

Page 3, lines 1-3: As I recall, Ogi et al. [2007, 2008] were discussing what called the “summer AO” pattern, not the AD.

Page 4, line 12: I leave it to another reviewer to comment on the validity of conducting an EOF analysis over such a very restricted spatial domain (70 to 90 deg. N).

Page 4, line 25: Again, Arctic amplification is not about the Arctic temperature trends

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alone, it's about the comparison between Arctic and global temperature trends. And it's not "polar amplification" - it's just the Arctic.

Page 5, lines 14-15. Assuming that the "Pacific section" refers to the Beaufort/Chukchi seas, why would there be a greater ice loss here in the later period when the motion is more onshore than in the previous period and would tend to transport thick ice from north of the Canadian Arctic Archipelago into the region?

Page 6, line 5: As far as I can see, no trend analysis has been performed on the time series. And I don't see much of anything resembling decadal scale variability in PC1. What I see is a series of ups and downs.

Page 6, lines 15-25: I have a very hard time convincing myself that the patterns for the earlier and later periods shown in Figure 4 are very different. In my opinion the authors are trying to read too much into these figures.

Page 7, line 16: Is melting the only thing going on here?

Page 8, line 1: The differences in ice motion between the two periods seems very nuanced to me. Again, I get the impression that that the authors are trying to read too much into the differences.

Page 8, line 12: Rebecca Woodgate has a number of papers addressing links between the Bering Strait heat inflow and sea ice conditions in the Chukchi Sea and potentially beyond. Also see: 10.1002/2016JC011977, which specifically examines predictability of ice conditions in the Chukchi Sea based on the Bering Strait heat inflow.

Page 8, line 15 It needs to be acknowledge here (or somewhere) that the last three summers have been very cyclonic over the central Arctic Ocean; in other words, the much bandied "intensification" of the Beaufort Sea high appears to have broken down.

Page 9, lines 16-33: I think it is very difficult to argue that the cause of the shift in the AD is due to a phase change in the PDO. All that one can really say is that the shift in the AD (which seems minor to me) is part of a large-scale pattern of change involving

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the PDO. The link is certainly interesting, but I'm hesitant to read too much into cause and effect.

Interactive comment on The Cryosphere Discuss., <https://doi.org/10.5194/tc-2019-18>, 2019.